U.S. Coal Exports

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Summary

The gap between available U.S. coal supply and demand may continue to widen as low cost natural gas becomes more attractive to electric power plants and uncertainties with emission regulations may inhibit new coal plant investments. Coal producers with excess supply will likely seek to expand their market abroad. Consequently, U.S. coal exports are forecast to continue to rise over the next decade and possibly longer. Growth potential in Asian markets seems large, but there are potential bottlenecks, such as infrastructure and potential rising costs of regulation, competition from other fuels, and transportation constraints that could slow export growth.

The U.S. Energy Information Administration (EIA), in its 2013 Annual Energy Outlook Early Release reference case, projects net exports of coal to trend up through 2040, almost 50% from 2011 levels, with some fluctuations. The significance of this may have short- and long-term ramifications as well as positive and negative consequences. Increased net exports could improve the U.S. trade balance as well as add government revenue from production that may otherwise decline because of falling domestic consumption. Environmentally, exporting coal may run counter to the current Administration's domestic environmental policies and affect U.S. efforts to address global environmental issues. Depending upon the nature of the coal exports, certain parts of the country may benefit economically. Current and projected coal exports, the associated infrastructure, and the environmental consequences have prompted interest by Congress.

The United States has been exporting coal since the late 1800s. From 2003 to 2012, U.S. coal exports have risen over 200%, mainly driven by competitive production costs, global demand, and lower prices, among other factors. Coal exports comprised 12% of U.S. coal production in 2012. In 2011, U.S. coal exports broke 100 million short tons (MST) for the first time since 1992 and in 2012 surpassed their peak of almost 113 MST in 1981. The value of U.S. coal exports has increased, rising from under $10 billion in 2010 to almost $16 billion in 2011, according to U.S. Energy Information Administration data.

Many factors will influence how much coal will be exported from the United States. Enough projects have been proposed that by 2016 the United States could be exporting more than double its current coal exports. Projects in the Pacific Northwest have attracted much of the attention, even though the Northeast continues to be the source for most exports.

Representatives from state and local agencies, particularly in Washington and Oregon, as well as industry, community, and environmental groups, along the potential coal transport corridor, have expressed outright support for or opposition to port terminal projects that would allow for increased export of Powder River Basin coal through the Pacific Northwest. Opponents have argued that increased train and barge traffic will have significant adverse impacts to the human, natural, and cultural environment. Project supporters have argued that the projects would create or maintain jobs in the construction, mining, and transportation industries and bring increased tax revenue to the states.

Broadly, the National Environmental Policy Act (NEPA) requires federal agencies to consider the environmental impacts of their actions before a final decision is made regarding that action.

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Introduction

The current gap between U.S. coal supply and domestic demand may widen as low cost natural gas becomes more attractive to electric power plants, and uncertainties with new environmental regulations discourage investment in new coal plants. Coal producers with excess supply will likely seek to expand their market abroad. Consequently, in the long run (over the next decade and possibly longer), U.S. coal exports are expected to rise. In the near term, however, the U.S. Energy Information Administration (EIA) projects coal exports to decline from a high point of 126 million short tons in 2012 to 107 million short tons in 2014. Growth potential in Asian coal markets seems large, but there are potential bottlenecks (e.g., lack of infrastructure, potential rising costs of regulation, competition from other fuels, and transportation), which could slow export growth. Also, limits on natural gas supply (for any number of reasons) would likely increase domestic coal prices and cut into exports. Although U.S. consumption of coal appears to be declining, other parts of world are increasing their use of coal.

U.S. consumption of coal declined from 2011 to 2012. Coal production also declined, but exports rose 17%.[1] The decrease in supply was driven, in part, by the decline in domestic demand. The EIA includes coal in its 2013 Annual Energy Outlook Early Release. In its reference case, net exports of coal may increase through 2040, increasing almost 50% from 2011 levels.[2] Increased net exports could improve the U.S. trade balance as well as add government revenue from production on federal lands that might otherwise decline because of falling domestic consumption. Exporting coal may run counter to the current Administration's domestic environmental policies aimed at reducing greenhouse gas emissions (GHG), and affect current U.S. policy goals addressing global climate change and other environmental issues. Depending upon the location of the coal exports, certain parts of the country may benefit economically.

Current and projected coal exports, issues associated with infrastructure, and the environment have prompted interest by Congress. Bills were introduced in the 112th Congress that supported increased coal exports (H.R. 3409, S. 3450) and sought to limit exports (H.R. 6202).

Coal export-related issues that have raised congressional concern include carbon emissions abroad, coal dust from rail transport, infrastructure development (particularly port expansion), and federal coal valuation for royalty purposes, among others.

Table 1. U.S. Coal Supply-Demand Balance

	2011	2012
Total Supply	**1,121.9**	**1,040.9**
Production	1,095.6	1,020.5

[1] For additional information on global coal production, see CRS Report R43011, *U.S. and World Coal Production, Federal Taxes, and Incentives*, coordinated by Marc Humphries, and for additional information on U.S. coal consumption, see CRS Report R42950, *Prospects for Coal in Electric Power and Industry*, by Richard J. Campbell, Peter Folger, and Phillip Brown.

[2] U.S. Energy Information Administration, *Annual Energy Outlook 2013 Early Release*, DOE/EIA-0383ER(2013), Washington, DC, December 5, 2012, http://www.eia.gov/oiaf/aeo/tablebrowser/#release=AEO2013ER&subject=7-AEO2013ER&table=15-AEO2013ER&region=0-0&cases=early2013-d102312a.

	2011	2012
Imports	13.1	9.2
Waste Coal Supplied	13.2	11.2
Total Demand	**1,110.2**	**1,015.0**
Consumption	1,002.9	889.3
Electric Power	932.5	824.8
Exports	107.3	125.7
Metallurgical	69.5	NA
Thermal	37.7	NA
Stock Change	0.2	8.2
Unaccounted	11.5	17.6
Exports/Production	9.8%	12.3%

Source: U.S. Energy Information Administration, Monthly Energy Review, March 27, 2013, http://www.eia.gov/totalenergy/data/monthly/pdf/sec6.pdf.

Notes: Units = million short tons (MST). May not sum due to rounding. According to EIA, waste coal is usable material that is a byproduct of previous coal processing operations, usually composed of mixed coal, soil, and rock (mine waste). Most waste coal is burned as-is in unconventional fluidized-bed combustors. For some uses, waste coal may be partially cleaned by removing some extraneous noncombustible constituents. Examples of waste coal include fine coal, coal obtained from a refuse bank or slurry dam, anthracite culm, bituminous gob, and lignite waste.

World Coal Supply

Global production, consumption, and trading of coal have increased over the last decade, and are projected to continue growing. In fact, worldwide coal was the fastest-growing source of primary energy in 2011, according to the International Energy Agency's (IEA's) *Coal Medium-Term Market Report 2012*.[3] Coal consumption is projected to also grow more than oil or natural gas over the next five years, according to the IEA report, and reach parity with oil as the most used fuel source in the world.[4]

World Coal Production

Worldwide, coal production has increased by nearly 60% since 2002, with most of the increase coming from China—a 130% rise. China accounted for about 50% of coal production in 2011, up from 34% in 2002. U.S. coal production has declined by 13 million tonnes of oil equivalent (Mtoe) over this time period.[5] The data in **Figure 1** illustrate that other countries such as Colombia, Indonesia, and India also had significant production increases since 2002. India's coal production grew by 60% over the past 10 years, while Indonesia's production more than tripled. Australia increased coal production by 26% over the same time period.

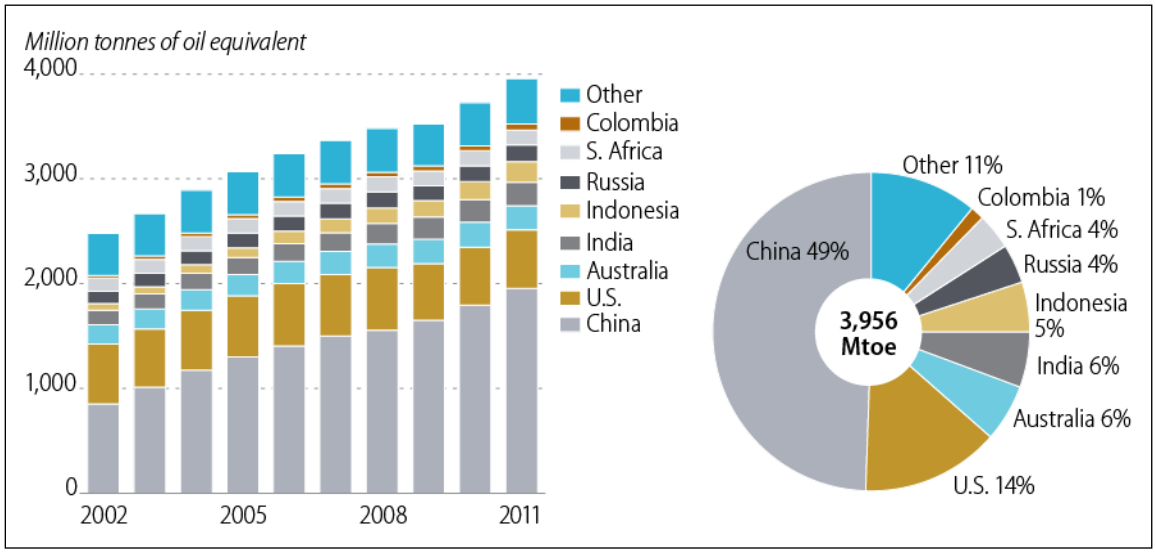
[3] International Energy Agency, *Coal Medium-Term Market Report 2012*, Paris, France, December 18, 2012, p. 12.

[4] Laszlo Varro, Head of Gas, Coal and Power Markets, *Medium Term Outlook for Coal presentation*, International Energy Agency, January 24, 2013, p. 3.

[5] The data provided in the report are in short tons (st), metric ton (mt) and in million tons of oil equivalent (Mtoe) because of the different reporting agencies. Tonnes = metric tons.

At the company level, the concentration of production worldwide is not significant. In 2010, the top five world coal producers accounted for about 18% of world production (Coal India (6%), Shenhua Group China (5%), Peabody Energy (3%), Datong Coal Mining Group-China (2%), and Arch Coal (2%)). The top 30 coal firms produced 40% of world production.[6]

Figure 1. World Coal Production, 2002-2011



Source: BP Statistical Review of World Energy, 2012.

Notes: Pie chart based on 2011 data.

World Coal Reserves and Resources

The United States ranked number one in the world in coal reserves in 2011, with almost 240 billion metric tons (mt) (28%).[7] Russia was second with an estimated reserve base of 157 billion mt (18%), with China in third with 115 billion mt (13%). Taken together, the top three countries hold 59% of the world's recoverable coal reserves. When India and Australia are added, the top five coal producing countries hold 75% of world recoverable coal reserves (see **Table 2**).

Table 2. Global Proved Coal Reserves, 2011

Billion tonnes

Country	Bituminous and Anthracite	Sub-bituminous and Lignite	Total	Percent of Total
United States	108.5	128.8	237.3	28
Russia	49.1	107.9	157.0	18
China	62.2	52.3	114.5	13
Australia	37.1	39.3	76.4	9
India	56.1	4.5	60.6	7

[6] International Energy Agency, *World Energy Outlook 2011*, Paris, France, November 9, 2011, p. 419, http://www.worldenergyoutlook.org/publications/weo-2011/.

[7] Units differ depending upon the source of information, which is why data differ. In this section, figures are cited in metric tonnes instead of short tons as is U.S. convention. 1 metric ton = 2,205 lbs.

Country	Bituminous and Anthracite	Sub-bituminous and Lignite	Total	Percent of Total
European Union	5.1	51.0	56.1	7
Africa	31.5	0.2	31.7	4
Other	55.2	72.2	127.4	15
World Total	404.8	456.2	860.9	100

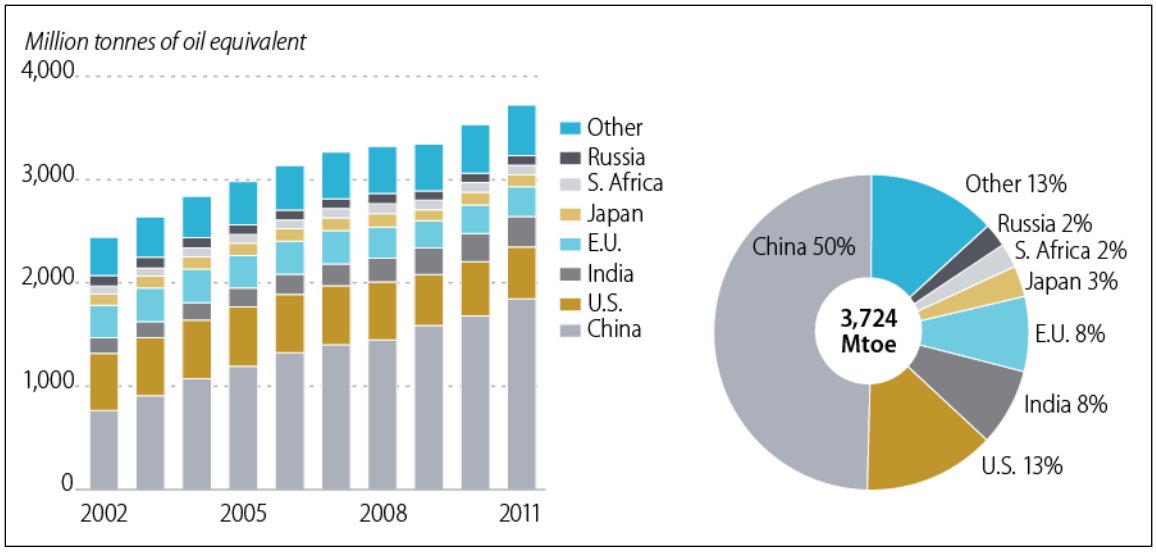
Source: BP Statistical Review of World Energy 2012, http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2011/STAGING/local_assets/pdf/coal_section_2012.pdf.

Notes: Percentages may not add to 100% because of rounding.

Global Coal Use on the Rise

As a result of increasing electricity demand, global coal consumption has steadily risen over the last decade, an era of economic recession, which portends opportunities for increases in U.S. coal exports. The IEA projects that by 2017 coal use will be on par with oil as the top fuel in the world's energy mix (see **Figure 2**).[8]

Figure 2. Global Coal Consumption, 2002-2011



Source: BP Statistical Review of World Energy, 2012.

Notes: Pie chart based on 2011 data.

Worldwide, coal is the largest contributor to primary energy growth, accounting for 65% of the increase in primary energy between 2010 and 2011.[9] And, China's coal consumption was the largest contributor to the global growth in coal, up almost 165 Mtoe, in 2011 for about a 10%

[8] Laszlo Varro, Head of Gas, Coal and Power Markets, IEA, "Medium Term Outlook for Coal," Presentation at CSIS, Washington, DC, January 24, 2013, p. 3.

[9] Primary energy, as defined in the *BP Statistical Review of World Energy, 2012*, comprises commercially traded fuels, including modern renewables used to generate electricity.

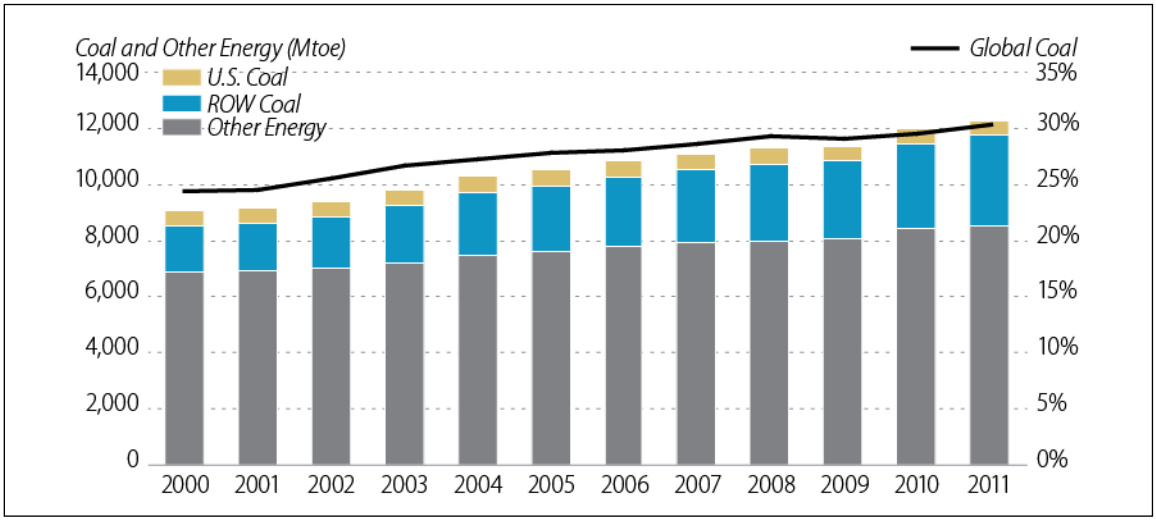
increase.[10] Most of China's coal consumption is for its rapidly expanding electricity generation sector (see **Figure 3**).

The global coal market in 2011 was over 3,700 Mtoe or 8.2 billion short tons (BST), up about 68% since 2000.[11] This represents an annual average growth rate of roughly 5%, the highest among fossil fuels. China dominates the global coal market, accounting for almost half of global coal consumption in 2011. For comparison, the world's second- and third-largest coal consumers, the United States and India, account for 13% and 8% of global consumption, respectively. The European Union consumed about 8%.

China's growing consumption of coal outpaced its production, taking that country from being a net coal exporter to a net importer. In 2000, China was the world's second-largest coal exporter, behind Australia. China started importing more than it was exporting in 2009 and became the world's second-largest importer, after Japan, according to EIA statistics.[12] In 2010, net imports to China represented 5% of China's domestic consumption.

Figure 3. Global Coal Growth as Part of Primary Energy Consumption

2000-2011



Source: BP Statistical Review of World Energy, 2001-2012.

Notes: Primary energy comprises commercially traded fuels. Units = million tonnes of oil equivalent (Mtoe)

International trade is more limited in coal than other fossil fuels. Roughly 15% of coal—1.2 billion short tons (BST) is traded globally versus 60% of oil and 30% of natural gas.[13] The largest coal consumers are also the world's largest producers—China, the United States, and India. However, outside of China and India, most of the growth in global coal production has come

[10] *BP Statistical Review of World Energy, 2012*, London, June 2012, p. 41, http://www.bp.com/statisticalreview.

[11] *BP Statistical Review of World Energy, 2012*, http://www.bp.com/sectionbodycopy.do?categoryId=7500&contentId=7068481, and the U.S. Energy Information Administration, *International Energy Statistics*, accessed September 14, 2012, http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm.

[12] U.S. Energy Information Administration, *International Energy Statistics*, http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm.

[13] Global imports divided by consumption.

from major coal exporters Indonesia (likely to curtail exports in the coming years for domestic use), Australia, Russia, and Colombia. Essentially, they are filling the space left in the market as China swung from being a net exporter to a net importer.

Globally Traded Coal

Global trade in coal has averaged about 15% of world production, with the United States ranking among the top five exporting countries in 2010 through 2012.[14] Australia, Indonesia, Russia, South Africa, and Colombia have also ranked in the top five coal exporting countries over the last five years. Meanwhile, Japan, China, South Korea, Taiwan, India, and Germany have ranked in the top five importing countries during those five years. Most notably, China climbed to be the second-largest importer in 2009, surpassing Japan for the top spot in 2012.[15]

Global Prices and Contracts

The value of coal varies according to certain characteristics—energy content, ash level, sulfur content, moisture, and volatiles—while contracts include factors such as use, coal quality, length of contract, delivery terms, and payment options.[16] These variables have made comparison of coals for export more difficult than for other hydrocarbons, which tend to be more uniform.

Coal prices around the world reached a peak in 2008 and then fell sharply with the global economy, as did oil and natural gas prices. As prices rebounded in 2009, the gap between the U.S. benchmark Central Appalachia coal price and other international coal prices widened (see **Figure 4**).

As more U.S. coal enters the global market, the additional demand will likely raise domestic prices while contributing low-cost coal to the world market. All else being equal, the additional U.S. low-cost coal might result in more coal being consumed worldwide.

[14] U.S. Energy Information Administration, *International Energy Statistics*, http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=1&pid=1&aid=4&cid=regions,&syid=2006&eyid=2010&unit=TST.

[15] Laszlo Varro, Head of Gas, Coal and Power Markets, IEA, "Medium Term Outlook for Coal" Presentation at the Center for Strategic and International Studies (CSIS), Washington, DC, January 24, 2013.

[16] Volatiles are defined as hydrogen, methane, carbon monoxide, and other hydrocarbons.

Figure 4. Global Coal Prices

2007-2012

Source: Morgan Stanley

Notes: All prices are **FOB (free on board)** at respective terminals. The API 4 Index price is the benchmark price reference for coal exported from South Africa's Richards Bay terminal. Units = U.S. dollars per short ton ($/ST). FOB prices are for the product plus the cost of loading the coal on a vehicle or vessel.

U.S. Exports: Trends Point Up

The United States has been exporting coal since the late 1800s.[17] From 2003 to 2012, U.S. coal exports rose over 200%, mainly driven by competitive production costs, global demand, and lower prices, among other factors[18] (see **Figure 5**). Coal exports comprised 12% of U.S. coal production in 2012.

The Recent Past of U.S. Coal Exports

The recent U.S. economic crisis caused a sharp decline in U.S. 2009 exports over 2008, but exports are again trending up, more than doubling since 2009. U.S. coal exports were aided by a drop in value of the U.S. dollar against other currencies, including those of other major coal exporting countries, such as Australia, Indonesia, and Russia. Exports of both metallurgical coal and thermal coal from the United States have been increasing since 2009, rising almost 87% and 73%, respectively.[19] Prior to 2009, exports of both had been on the rise, but the economic crisis stifled that growth.

In 2011, U.S. coal exports broke 100 MST for the first time since 1992 and in 2012 reached 126 MST, surpassing their previous peak of almost 113 MST in 1981. The value of U.S. coal exports

[17] Office of Technology Assessment, *Coal Exports and Port Development*, NTIS order #PB81-203358, April 1981, p. 33.

[18] U.S. Energy Information Administration, *U.S. Coal Exports by Country of Destination, Annual, database*, October 19, 2011, http://www.eia.gov/totalenergy/data/annual/pdf/sec7_13.pdf.

[19] See **Appendix B** for explanation of thermal and metallurgical coal.

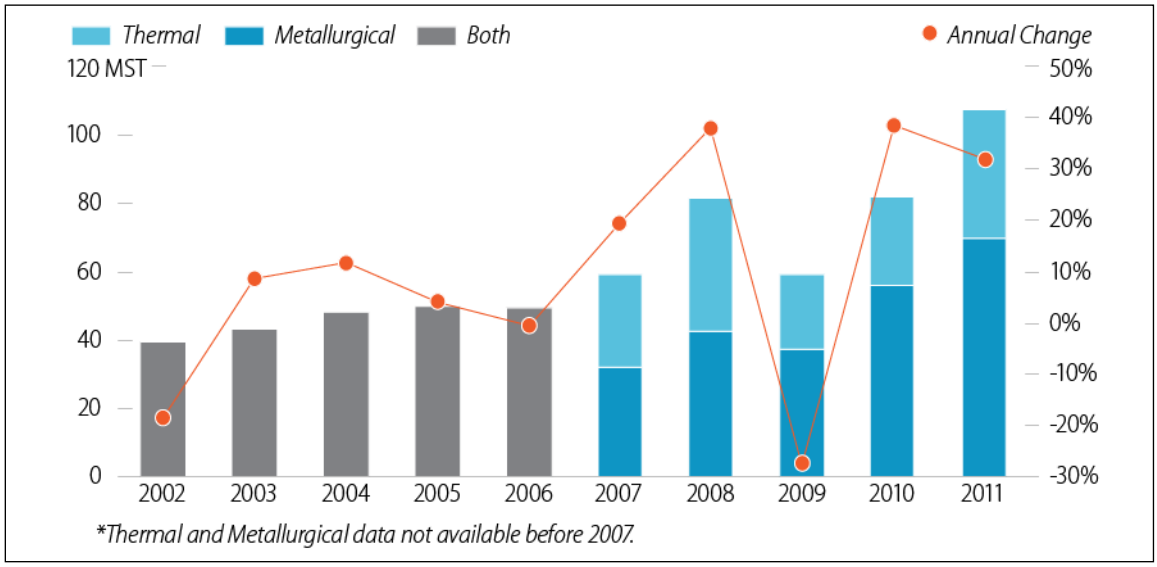
has increased, rising from under $10 billion in 2010 to almost $16 billion in 2011, according to EIA data (see **Figure 6**).[20]

Exports by State

Figure 7 shows a breakdown of coal exports by states. West Virginian coal accounted for the largest portion of U.S. coal exports. Over the last five years, coal from the Appalachian region fell as a percent of the total amount of coal exported, but has grown almost 70%, in absolute terms, since 2007.[21] Other key Appalachian region coal exporters include Pennsylvania and Virginia. Western states, led by Montana, comprised the second-largest share of exports, 21%, in 2011. The Interior region is up the greatest amount in percentage terms, rising from 1.5 MST to 7.7 MST during the same time period.

Figure 5. U.S. Coal Exports

2002-2011



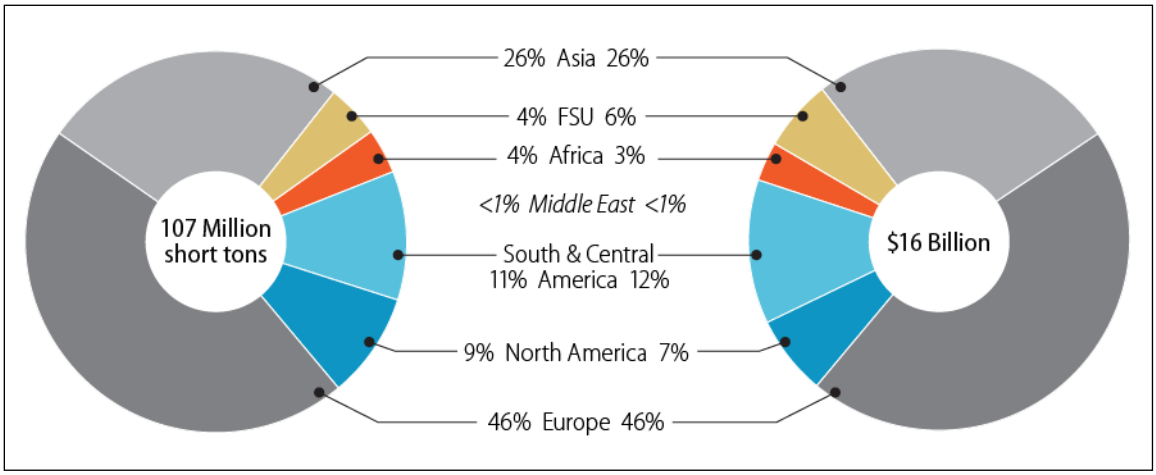
Source: U.S. Energy Information Administration, http://www.eia.gov/totalenergy/data/annual/showtext.cfm?t=ptb0705.

Notes: Units = million short tons (MST).

[20] U.S. Energy Information Administration, *Historical Coal Exports database*, May 1, 2012, http://www.eia.gov/coal/data.cfm#imports.

[21] The United States has three major coal producing regions: Appalachian, Interior, and Western

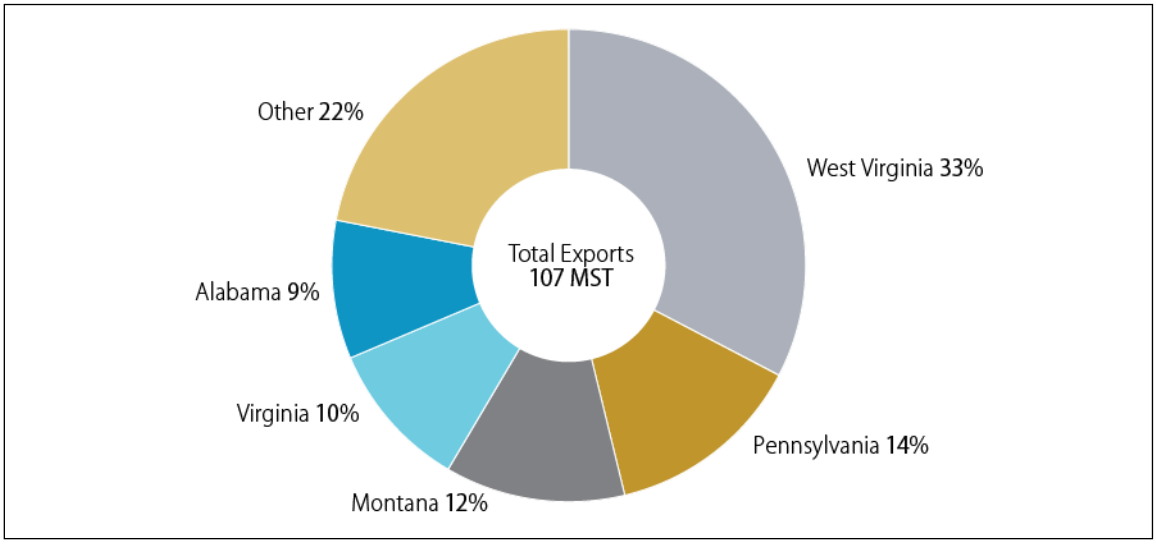
Figure 6. U.S. Coal Exports and Trade, 2011



Source: U.S. Energy Information Administration, Historical U.S. Coal Exports by Year and Quarter (2002 – 2011), http://www.eia.gov/coal/data.cfm#imports.

Notes: FSU = former Soviet Union.

Figure 7. U.S. Coal Exports by State, 2011



Source: U.S. Energy Information Administration, http://www.eia.gov/coal/distribution/annual/pdf/o_11foreign.pdf.

Notes: Units = million short tons (MST).

Domestically, other factors have contributed to the rise in U.S. coal exports since 2009. U.S. natural gas prices have trended significantly lower since peaking in mid-2008 because of the economic crisis and the introduction of large amounts of shale gas to the market. Coal and natural gas compete directly in electric power generation. Historically, coal plants were more expensive to build, but the fuel cost was cheaper. Natural gas prices in 2012 have dipped below coal prices on an energy equivalent basis, altering the industry's perception. Coal and natural gas reached parity in electricity generation in April 2012 for the first time. But are cheap natural gas prices a sustainable trend? Electricity generation accounts for 93% of coal consumption, and the decrease

in coal generation contributed to lower coal prices relative to international markets. The trend for gas prices is projected to continue to decrease the competitiveness of coal as a fuel for electric power generation in the U.S. market, according to the EIA. Therefore, in order to maintain production levels, coal companies are looking more to foreign markets and exports as a growing segment of their market.

Of the 107 MST exported in 2011, about 54 MST went to Europe and 28 MST went to Asia. Asia's largest recipients include South Korea, Japan, and China (10 MST, 7 MST, and 6 MST respectively).[22] Nearly 70 MST of U.S. exports in 2011 were metallurgical coal (coking coal), up from 56 MST in 2010. Steam (thermal) coal accounted for 38 MST in 2011, up from 26 MST in 2010. Metallurgical coal has a higher energy content and is used to make coke used in making steel. It is mostly produced in Appalachia, whereas most steam coal used for heating and power generation is produced from the Illinois Basin and the Powder River Basin (PRB).

Table 3. U.S. Exports to Selected Countries, 2011

in MST

	Metallurgical coal	Steam Coal
Western Hemisphere	**14.2**	**7.2**
Canada	4.2	2.7
Brazil	8.3	0.3
Other	1.7	4.2
Europe	**34.3**	**19.6**
France	1.8	2.3
Germany	2.1	2.6
Italy	4.5	1.1
Netherlands	6.5	4.3
Ukraine	4.7	0.1
UK	2.7	4.2
Other	12.0	5.0
Asia Pacific	**19.7**	**7.8**
China	4.6	1.0
India	3.8	0.7
Japan	6.2	0.7
South Korea	5.1	5.4
Other	0.0	0.0
Africa	**1.4**	**2.7**

Source: U.S. Energy Information Administration, *Quarterly Coal Report*, April 18, 2012, http://www.eia.gov/coal/production/quarterly/.

Most U.S. coal is exported through Mid-Atlantic ports in the Eastern U.S. customs district (see **Table 4**), particularly Norfolk, VA, and Baltimore, MD. Nearly 40% of U.S. exports passed through Norfolk, and 34 MST of 41 MST exported were metallurgical coal. This coal was

[22] U.S. Energy Information Administration, http://www.eia.gov/coal/production/quarterly/pdf/t7p01p1.pdf.

primarily from West Virginia, Pennsylvania, and Virginia. A large amount of coal is also exported out of the Southern ports of Mobile, AL, and New Orleans, LA. Western exports of coal were 7.4 MST, of which nearly 5 MST passed through the Seattle, WA, customs district.[23]

Table 4. U.S. Coal Exports by Customs Districts

in MST

	2010	2011
Eastern District	**47.5**	**62.1**
Baltimore, MD	13.9	19.3
Norfolk, VA	32.0	41.0
Other	1.6	1.9
Southern District	**19.8**	**32.6**
Mobile, AL	9.7	10.1
New Orleans, LA	9.4	21.4
Other	0.7	1.1
Western District	**5.1**	**7.4**
Seattle	3.5	4.9
Other	1.6	2.5
Northern District	**9.2**	**4.9**
Total Exports	**81.7**	**107.3**

Source: U.S. Energy Information Administration, *Quarterly Coal Report*, April 18, 2012, http://www.eia.gov/coal/production/quarterly/.

Notes: May not sum to total due to rounding. Customs districts incorporate a wider geographic area than just the place name. For instance, the Seattle customs district includes Aberdeen, Spokane, and Blaine, WA.

With greater energy content per pound, metallurgical coal can be more attractive to ship over longer distances. Further, global metallurgical coal demand has been boosted in recent years due to the rapid economic growth in emerging markets, which involved infrastructure and industrial expansion, creating demand for steel. According to the IEA, global metallurgical coal consumption grew by 87% between 2000 and 2010, versus 70% growth of steam coal and 12% growth in brown coal or lignite,[24] with China accounting for 80% of global metallurgical coal consumption growth between 2000 and 2010.[25] For context, according to the IEA, metallurgical coal makes up 14% of global coal consumption but more than 30% of the international coal trade.[26]

[23] Customs districts include a wider geographic area than just the city or town. See http://www.census.gov/foreign-trade/schedules/d/dist.txt.

[24] Brown coal or lignite is a type of coal with low energy content.

[25] IEA, *Coal Information 2011—With 2010 Data*, December 2011.

[26] Ibid. Note: EIA assumes existing statutes and regulations in its reference case at the time it is made.

The Future of U.S. Coal Exports

There are several key factors likely to influence how much coal will be exported from the United States. Several export terminal projects have been proposed by 2016, such that the United States could be exporting more than double its current coal exports. Projects in the Pacific Northwest have attracted much of the attention, even though the Northeast or Mid- and South Atlantic ports continue to account for most exports. Additionally, the Gulf Coast export facilities may be in a good position to expand capacity and incrementally increase exports. In its 2013 Annual Energy Outlook Early Release, EIA's base case projects that total U.S. coal exports will rise steadily starting in 2013 through 2038, growing over 50% during the time period. Also, it is worth noting that EIA's coal export base case has been revised significantly higher since its 2012 forecast.[27]

Powder River Basin: A New Focus for Exports

There is growing interest in exporting Powder River Basin (PRB) coal. Low production costs, large reserves and production, and low sulfur content can make PRB coal attractive to domestic and foreign electric utilities. However, PRB coal has greater moisture content and lower energy content per pound, making it more expensive to transport on a per unit of energy basis.

Today, nearly all coal produced from the PRB is consumed within the United States (mostly in the Midwest), and it is used almost entirely for electric power generation. PRB coal has a relatively low sulfur content, which makes it easier for coal-burning utilities to meet Clean Air Act (P.L. 101-549) restrictions on sulfur dioxide emissions. The PRB sits largely on federal lands in Montana and Wyoming, and according to estimates accounts for more than 90% of the total coal produced from the two states. In 2010, the latest year for export data by state, Wyoming and Montana produced just over 487 MST of coal, of which less than 1% was exported.[28]

While the vast majority of PRB coal stays within the United States, exports of PRB coal have increased in 2011 as total U.S. exports have increased significantly. Coal distribution data from EIA for 2011 show that 95% of PRB coal has been distributed around the United States, mostly for electric generation.[29] Note that while PRB's low sulfur content may help utilities meet EPA sulfur regulations, new EPA regulations, such as those on hazardous air pollutants, may still reduce domestic PRB demand if overall coal-fired electricity declines.[30]

PRB coal is exported primarily from Canadian terminals at Roberts Bank (near Vancouver, British Columbia) and Ridley Terminal at Prince Rupert, British Columbia. PRB coal is transported to both facilities for export via railway. However, the Canadian export terminals have reached capacity.[31]

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[27] See Table 15 in EIA, *Annual Energy Outlook 2012*, June 25, 2012, http://www.eia.gov/forecasts/archive/aeo12/source_coal.cfm.

[28] U.S. Energy Information Administration, *Annual Coal Distribution Report*, Washington, DC, November 30, 2011, http://www.eia.gov/coal/distribution/annual/.

[29] It is unclear how much of the remainder went to export or into domestic stockpiles. U.S. Energy Information Administration, *Quarterly Coal Distribution Report*, Washington, DC, April 16, 2012, http://www.eia.gov/coal/distribution/quarterly/.

[30] Jeremy Fugleberg, "Utility's cuts could trim demand for Wyoming's Powder River Basin coal," Wyoming Star Tribune, June 21, 2011.

[31] Bruce Kelly, "Which way(s) west for coal?" *Railway Age*, March 2012, p. 18.

Although the Canadian export facilities have plans for expansion that may better accommodate U.S. exports,[32] PRB coal producers have been searching for a potential domestic export link to the growing Asian market. That link appears to be through the Pacific Northwest. Three port terminal projects for exporting coal in Washington and Oregon have permit applications pending before the U.S. Army Corps of Engineers (the Corps):[33]

- Gateway Pacific Terminal (GPT) and Rail Expansion, Cherry Point, WA;[34]
- Millennium Bulk Terminal (MBT), Longview, WA;
- Coyote Island Terminal (CIT) at the Port of Morrow, Boardman, OR.[35]

Several other projects have been discussed, but it is unclear at this point how many or when any additional projects may move forward.

Gulf Coast Export Capacity Likely to Grow

Although increasing coal exports from the Pacific Northwest are attracting the most attention, the Gulf Coast may be a more likely candidate to add export capacity in the short term. The region has more existing capacity to build from and less local opposition to increased exports.[36] Over the next five years, over 40 MST of proposed expansions and new projects will be evaluated, particularly for Illinois Basin coal (IB) and PRB coal. Transporting IB coal by barge to export terminals in the Gulf, especially New Orleans, is cheaper than moving other coal to the coasts by rail. Located in the central United States, the Illinois Basin ranges across Illinois, Indiana, and western Kentucky. The coal produced in this region is bituminous coal with relatively high sulfur content. Production within the state of Illinois (23.9 MST) has been a key driver of the basin production increase over the first half of 2012.

Exports of IB coal have been rising but only account for about 13% of IB production, which has also been increasing. IB coal is cost competitive on the international market, with most exports going to the United Kingdom and the Netherlands (approximately 3.8 MST and 1.4 MST, respectively), but usually requires a discount because of its high sulfur content. China was the third-largest recipient, with 1.2 MST. Coal exports to international markets from Illinois doubled from 2010 to 2011 (2.5 million tons in 2010 to 5 million tons in 2011). In addition, domestic demand for coal from the Illinois Basin, particularly in Illinois itself, increased as a result of a shift in demand toward the Illinois Basin's low-cost, high-sulfur coal and away from Central Appalachia's high-cost, low-sulfur coal. Domestic utilities that have added scrubbers can burn high-sulfur coal while remaining in compliance with existing requirements to reduce sulfur dioxide emissions. Because of the relatively low cost of Illinois Basin coal and its use in larger,

[32] "Thermal Coal Terminal Proposed for Fraser River," Vancouver Sun, Nov. 24, 2012, p. H-1.

[33] A permit from the Corps is needed for any project that discharges dredge or fill material in waters of the United States or wetlands, pursuant to provisions in Section 404 of Clean Water Act; and for the construction of any structure in, over, or under navigable waterways of the United States, including excavation, dredging, or deposition of these material in these waters, pursuant to Section 10 of Harbors Act of 1899. The proposed projects in Washington and Oregon will involve such activities and must obtain either or both a Section 404 and Section 10 permit from the Corps, before the project can proceed. Discussion of the Corps permit requirements is beyond the scope of this report. For information regarding applicable authorities, obligations, or regulatory requirements applicable to the Corps obligations to permit coal export terminals, congressional clients may contact Nicole Carter.

[34] Information about the Gateway Pacific Terminal is available at http://gatewaypacificterminal.com/.

[35] Information about Ambre's Millennium Bulk Terminal and Coyote Island Terminal projects are available at http://ambreenergy.com/projects/millennium.

[36] Beth Ward, "Outlook for Western and US Gulf coal," *Platts*, October 5, 2012, "online edition."

efficient plants with modern pollution control equipment, its producers were less affected by recent low natural gas prices.

East Coast Exports

Coal shipments from East Coast terminals of Appalachian coal have dominated U.S. coal exports, accounting for almost 60% and 71%, respectively, in 2010 and 2011. Appalachian coal, led by production in West Virginia, has declined as a percent of overall U.S. coal exports over the last five years, but has grown almost 70% in absolute terms. Coal exports from Pennsylvania and Virginia are also up, 169% and 65%, respectively, in the same period.

Multiple projects are being reviewed to increase East Coast export capacity of Appalachian coal. Although there are proposals for constructing new facilities, most companies are looking to expand their existing terminals: expansions tend to have fewer regulatory requirements and lower cost.

Exports: Transportation Issues

Getting Coal to Ports

Given coal's low value-to-weight ratio, the large volume and non-time sensitive nature of shipments, and the long distances typically required for movement from coal mine to port, rail and barge offer the most economical means of transporting coal for export. In the West, a coal train of 120 cars can carry over 14,000 tons of coal (118 tons per car). Coal trains in the East are somewhat shorter in length. One barge holds 1,570 tons of coal but 15 barges (holding 23,550 tons) are often tied together in a tow through locked portions of inland rivers. On the Mississippi River below St. Louis, where there are no locks, 30 to 40 barges can make up a single tow of coal destined for terminals on the Mississippi River, where it is loaded aboard oceangoing ships for export from Louisiana.

Rail transport from mid-Atlantic mines to Norfolk, VA, has historically been the leading pathway for U.S. exports of coal. Secondary pathways include movement of Alabama coal to Mobile by rail and/or truck, barge transport of Midwest and Ohio Valley originated coal to Mississippi River Delta ports, and rail transport of Pennsylvania coal to Baltimore (see **Appendix A**, **Figure A-1** for U.S. coal regions, and infrastructure). Some U.S. coal is exported from Ohio across the Great Lakes to Canada. Western U.S. coal is also shipped by rail to Duluth, MN, and then through the Great Lakes to Quebec, where it is moved to large oceangoing ships for export to Europe.[37]

An obvious way to export PRB coal to China, Japan, or Korea would be through ports in Washington, Oregon, or British Columbia, Canada. Most coal from the PRB is currently moving east or south by railroad. A small fraction moves by rail to Washington and Oregon for domestic use and to Vancouver and Prince Rupert, BC, for export. While not currently used heavily for coal transport, east-west rail lines are the main pathways for carrying Pacific Northwest port traffic. However, even though coal trains are slower and less time-sensitive than trains carrying other commodities, they are cumbersome to move to sidings due to their exceptional weight, and can interfere with other traffic.[38]

Coal terminals at the California ports of Richmond, Stockton, Los Angeles, and Long Beach can be used to export coal from other western mines to Asia. Although the routing is more circuitous,

[37] "Drought Weighs On Great Lakes Coal Shipments," *Coal Transportation,* Sept. 18, 2012, p. 5

[38] Their exceptional weight puts wear and tear on switches and varying train speed burns more fuel.

PRB coal could be exported to China, Japan, or Korea by rail through Texas ports or through Mississippi River Delta ports (possibly in combination with barge transport from upriver terminals). These routes avoid the Rocky Mountains and more severe winter weather, and the tracks are in place to handle heavy coal traffic. The central location of Gulf ports also allows for some hedging against coal sourcing (western, central, or Appalachian mines) as well as Trans-Pacific versus Trans-Atlantic destination markets (India is closer to Gulf ports via a Trans-Atlantic crossing and passage through the Suez Canal). Charleston, SC, and Philadelphia, PA, on the East Coast could become additional conduits for export of Appalachian coal.[39]

Most rail freight travels under rates negotiated between shippers and railroads. Typically, rates are specified in confidential contracts that may last for months or years, and may include other provisions such as discounts to the shipper for exceeding a certain volume during a given period or penalties to the railroad for late delivery. A coal contract might cover shipments from a single mine or to a single power plant, but it could also cover multiple origination or destination points.

Under existing law, governments at all levels have limited influence over the type or quantity of cargo railroads carry on their networks. Railroads' construction plans are generally not subject to state or local permitting laws,[40] and approval by the federal Surface Transportation Board is necessary only for construction of new railroad rights-of-way and railroad mergers or acquisitions and generally not for improvements to existing lines.[41] A railroad's share of the cost when improving highway-rail grade crossings is limited by federal law.[42]

PRB Rail Tracks

As the nation's largest source of coal, the PRB has been the focus of much attention. Union Pacific and BNSF Railroads share a right-of-way out of the PRB—the "joint line."[43] It is 103 miles in length and is mostly triple tracked with a fourth track on segments with hills. It is the busiest rail track in the world,[44] carrying most of the PRB coal from the mines to points south and east. In May 2005, two derailments caused by ballast[45] deterioration from heavy rains and coal dust (the railroads contend coal dust prevents proper drainage) severely interrupted PRB shipments. The railroads made extensive repairs and upgrades to the line but this took two years to complete. To keep coal dust from blowing off cars in transit, railroads are mounding or shaping the coal more uniformly when loading (to reduce wind resistance), and applying a surfactant as a sealant. The railroads and coal shippers have disputed who should pay for these measures.[46] Plans for an additional line into the PRB from the north, the Tongue River Railroad, are under review by the Surface Transportation Board (STB).[47]

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[39] SNL Coal Report, *U.S. Coal Export Capacity to Grow Nearly 30% by 2015,* July 16, 2012.

[40] As per 49 U.S.C. 10501(b).

[41] 49 U.S.C. 10901 et seq., 49 U.S.C. 11321 et seq.

[42] 23 U.S.C. 130; 23 C.F.R. 646.210.

[43] Union Pacific and BNSF are the two large (Class I) railroads whose networks cover the western United States.

[44] Testimony of Janssen Thompson, General Manager, Powder River Division, BNSF Railway Co., U.S. Congress, House Committee on Resources, Subcommittee on Water and Power, hearing, *Keeping the Lights On and Maintaining Wyoming's Jobs: Overcoming the Challenges Facing Western Power Generation Facilities*, 109th Cong., 2nd sess., August 9, 2006, p. 2.

[45] Ballast is the bed of crushed stone under the track.

[46] See STB Finance Docket #s FD 35305 and FD 35557; http://www.stb.dot.gov.

[47] See STB Finance Docket # FD 30186. This project dates back to the late 1990s.

Barge Infrastructure Issues

A growing concern of barge operators has been the reliability of locks because of more frequent scheduled and unscheduled maintenance by the Army Corps of Engineers. Many of the locks were originally constructed in the 1930s or 1950s. The cost of keeping locks functioning has increased significantly in recent years, and has surpassed current financing mechanisms. This includes a 20-cent-per-gallon federal tax on barge fuel that offsets about 10% of the federal cost of providing inland waterway infrastructure. The insufficiency of funds generated by the fuel tax would be exacerbated if demand for coal were to decline substantially. In a period of constrained federal budgets, Congress is evaluating alternatives for financing inland waterway infrastructure.[48]

Harbor Depths

Most coal shipped overseas from the United States is carried in Panamax vessels. These vessels are of a size limited by the dimensions of Panama Canal locks. They can carry about 60,000 tons of coal to keep their draft from exceeding 40 feet, the allowable draft depth of Panama Canal locks. Some U.S. export coal is loaded into Capesize vessels (which are too large for the Panama and Suez Canals and therefore must sail around the capes of South Africa and South America). Capesize vessels have a capacity of 90,000 to 200,000 short tons and a draft in the range of 48 to 56 feet. The Capesize vessels loading coal at Norfolk and Baltimore are in the smaller range of this class with drafts up to 50 feet. The expansion of the Panama Canal in early 2015 will allow smaller Capesize vessels with 50-foot drafts to pass through, but many U.S. ports and foreign unloading ports have insufficient depth to handle this type of ship. As discussed in greater detail in the U.S. Export section of this report, below, the three proposed port terminals with permit applications would have capacities of 54 million metric tons (GPT), 44 million metric tons (MBT), both in Washington State, and 8 million tons (CIT) in Oregon.

The economies of scale that can be achieved with a ship carrying twice as much cargo (Capesize versus Panamax) can significantly reduce the per ton cost of ocean transport. Only Puget Sound and Los Angeles area terminals have the depths to handle large Capesize vessels. **Table 5** below lists the depths of ports that currently export coal or have been mentioned as possibly handling coal in the future. With the exception of Puget Sound ports (Bellingham), Southern California ports, and Canadian ports, which are all naturally deep harbors, all of the ports listed require regular maintenance dredging (ranging from continuous to yearly to episodic) in order to maintain channel depths and widths. Congress is debating the appropriate level of funding for harbor maintenance.[49]

Table 5. Harbor Depths of Current or Proposed Coal Ports by Region

(depth in feet at mean low water, if tidal)

Harbor	Depth (in feet)
Canada	
Prince Rupert, Canada	75
Vancouver, Canada	68-75

[48] For further discussion, see CRS Report R41430, *Inland Waterways: Recent Proposals and Issues for Congress*, by Charles V. Stern.

[49] See CRS Report R41042, *Harbor Maintenance Trust Fund Expenditures*, by John Frittelli.

Harbor	Depth (in feet)
Quebec, Canada	50
Western	
Bellingham, WA (Cherry Pt.)	96
Lower Columbia River, OR and WA	43
Coos Bay, OR	37
Richmond, CA	38
Stockton, CA	35
Los Angeles, CA	72
Long Beach, CA	50
Gulf Coast	
Corpus Christi, TX	45
Houston/Galveston, TX	45
Lower Mississippi River, LA	45
Mobile, AL	45
Eastern	
Charleston, SC	45
Norfolk/Hampton Roads, VA	50
Baltimore, MD	50
Philadelphia, PA	40
Other	
Great Lakes	28-32

Source: U.S. Army Corps of Engineers, port and terminal websites.

Notes: Coal ships generally can wait for high tide before transiting a harbor. Ships require two to three feet of under-keel clearance.

Port Development and Maintenance

Generally, commercial port development is initiated and governed at the local level by harbor communities via a port authority, not by the federal government. A port authority could be a function of state, county, or city government. Federal jurisdiction over port development is primarily concerned with waterside infrastructure and operations. The U.S. Army Corps of Engineers is responsible for dredging shipping fairways and maintaining breakwaters and jetties. Reflecting local concerns, Congress authorizes the depths of harbors and determines the Corps' annual budget for harbor maintenance and operations.[50] Deepening a port is funded from the General Treasury, while Corps maintenance costs are paid with an *ad valorem* tax on imported and domestic port cargo.[51] Non-federal stakeholders are responsible for dredging ship berths and other non-federal channels in ports. The development of landside terminal infrastructure, such as

[50] For further information on the Corps responsibility for waterside infrastructure, see CRS Report R41042, *Harbor Maintenance Trust Fund Expenditures*, by John Frittelli, and CRS Report R41961, *Army Corps Fiscal Challenges: Frequently Asked Questions*, by Nicole T. Carter and Charles V. Stern.

[51] The tax was originally also assessed on exported cargo but this practice was declared unconstitutional.

coal unloading/loading facilities, is typically financed by private industry but may be assisted by the port authority. Terminal property could be privately owned by a shipper or owned by the port authority and leased to a terminal operator.

Shipping Rates

Shipping rates in the dry bulk sector are notoriously volatile, depending on global supply and demand conditions. A new vessel requires two or more years to build and this lag can lead to oversupply or shortage conditions. Dry bulk vessels are the simplest big ships to build and are favored by new shipyards in boom years. Such ships are versatile, geographically and across commodities. Coal competes with iron ore for Capesize vessel capacity and with cement, steel, fertilizer, woodchips, salt, and grain for Panamax vessel capacity. Ocean freight rates, especially for longer trans-Pacific voyages, are significant relative to the value of coal, and thus fluctuations in dry bulk vessel rates will affect the price competitiveness of U.S. coal compared to foreign sources. Currently, dry bulk rates are low but their range of decline in recent years also indicates their upswing potential. From 2010 to 2011, dry bulk rates generally decreased by 70% to 80%.[52]

Coal Exports and the Environment

Support and Opposition to Increased PRB Exports

Representatives from state and local agencies along the potential coal transport corridor, particularly in Washington and Oregon, as well as industry, community, and environmental groups, have raised certain concerns over port terminal projects that would allow for increased export of PRB coal through the Pacific Northwest. Opponents, including several environmental groups, have argued that increased train and barge traffic would have significant adverse impacts to the human, natural, and cultural environment.[53] Environmental groups have recently filed a lawsuit against the BNSF Railway Company and several coal companies under the Clean Water Act in the U.S. District Court for the Western District of Washington.[54] Project supporters have argued that the projects would create or maintain jobs in the construction, mining, and transportation industries and bring increased tax revenue to the states. Supporters such as the coal companies and labor unions also argue that many potential adverse impacts can be mitigated. Some stakeholders are taking a wait-and-see approach—recognizing potential benefits, but waiting to see what the cumulative effects of the various port terminal projects may be, including mitigation measures that would be implemented, before deciding whether potential benefits outweigh adverse impacts.

Stakeholder concerns over the cumulative impacts to communities, tribes, states, and regions primarily pertain to effects of increased rail and barge transport of PRB coal through the Pacific Northwest. Considering the pending and potential projects, it would appear that annual PRB coal export capacity could expand to exceed 100 million short tons. Rail industry representatives have stated that such an increase in export capacity could result in 8 to 16 additional trains per day. The coal would arrive through the Columbia River Gorge by rail from the PRB in Montana and Wyoming, and continue by rail and/or barge to export facilities in Washington and Oregon.

[52] UNCTAD, *Review of Maritime Transport 2011*, pp. 72-75.

[53] Among the environmental groups are the Sierra Club, Puget Soundkeeper Alliance, Earthjustice, and Columbia Riverkeeper.

[54] In the United States District Court for the Western District of Washington, Case 2:13-cv-00967-JCC, Filed 6/04/13. The plaintiffs argue that the coal trains are discharging coal pollutants into waters throughout Washington.

The potential for an increase in mile-and-a-half long coal trains has generated concern regarding potential adverse impacts from increased coal dust emissions to air and deposition to land or surface water; traffic congestion and increased wait times at rail crossings; potential derailments or delays to emergency response vehicles; and noise and vibrations high enough to cause structural damage. Dredging and construction activities in waterways to accommodate increased barge traffic and deep-water vessels have also generated concern over potential impacts to fisheries, marine ecosystems, or endangered species habitat.[55] Also, some stakeholders have cited broader global climate change impacts associated with increased coal burning in Asia.

Project proponents argue that many of the potential adverse effects, particularly those related to increased barge and rail transport, can be mitigated or largely eliminated.[56] However, some stakeholders have expressed concern that the potentially broader, cumulative impacts of pending and possible future projects will not be adequately identified and, thus, not be addressed.

Efforts to explicitly require or negotiate agreements with coal producers and transporters to mitigate effects of transporting PRB coal through the Pacific Northwest will likely occur within the context of existing local, state, tribal, or federal requirements applicable to individual port terminal projects. Since permit applications have been submitted to the Corps, state governors, local, state, tribal, and federal agencies, community and environmental organizations, and individual members of the public have submitted comments to the Corps urging them to ensure that indirect and cumulative impacts of the projects are fully identified and considered before they make a final decision whether to issue those permits. The framework within which the Corps will identify and analyze indirect and cumulative project impacts will comply with the National Environmental Policy Act (NEPA).

Opponents of the coal export projects have asked the Army Corps of Engineers to conduct a more comprehensive region-wide environmental impact statement that would look at impacts ranging from mining to burning U.S. coal overseas. This viewpoint was rejected by the Corps of Engineers, stating that an analysis of the potential broad-based impacts, i.e., from mining through burning U.S. coal overseas, was beyond their scope and jurisdiction. However, the Washington Department of Ecology has plans for a comprehensive review of environmental, transportation, health, and climate issues before the coal ports can be built. Scoping the environmental review for the proposed terminal near Longview, WA, being coordinated by the Department of Ecology, the Army Corps of Engineers, and Cowiltz County, began on August 16, 2013. The three agencies plan to issue a joint environmental impact statement (EIS).

Coal Exports and Greenhouse Gas Emissions

Two perspectives may shape policy makers' consideration of greenhouse gas emissions (GHG) emissions and the coal export issue: a legal view and a physical/environmental view. From the legal perspective, some might ask whether coal exports could put the United States at risk of violating obligations under existing or future domestic laws or international agreements to

[55] Concerns common to communities along the coal transport corridors can be seen in statements made by Oregon's Multnomah County Chair, Jeff Cogen in September 10, 2012, remarks to the Multnomah County Health Department requesting a study of the effects of coal train export through the county, available at http://web.multco.us/news/chair-jeff-cogens-prepared-remarks-coal-train-export-through-multnomah-county.

[56] For example, releases of coal dust to the air or its deposition on adjacent structures, land, or surface water could be minimized or largely eliminated through the use of enclosed barges, construction of enclosed loading and/or unloading terminal facilities, or the use of enclosed train cars or implementation of certain coal handling practices (the application of surfactants or loading coal to reduce drag on coal piles).

address climate change. From a physical view, regardless of legal requirements, a question is whether increasing coal exports may exacerbate climate change and the risks it poses by increasing U.S. and/or global emissions of greenhouse gases.

GHG Emissions from Coal Production and Combustion

Coal production and use result in emissions of greenhouse gases (GHG) comprised mostly of carbon dioxide (CO_2) and methane (CH_4). These gases are believed to contribute to rising global average temperatures and other climate changes.[57] Methane is primarily associated with fossil fuel production while carbon dioxide results primarily from coal combustion.

Coal seams contain methane, which typically is released when coal beds are disturbed. The methane emissions continue for many years after mining ends. Globally, coal production is estimated to have contributed about 10% of the higher concentrations of methane in the atmosphere since the Industrial Revolution began. Methane is roughly 56 or 21 times more potent (ton-for-ton) than carbon dioxide over a 20-year or 100-year period, respectively. (The index depends on the time period of policy-making interest: CO_2 remains in the atmosphere for hundreds of years once emitted, while methane in the atmosphere oxidizes to CO_2 or other compounds with a half-life of about a decade.) Methane emissions may be effectively abated, frequently for safety and their energy value.

Coal combustion releases carbon dioxide, the most pervasive GHG. Globally, coal contributes an estimated 43% to energy-related emissions of CO_2, which in turn is about three-quarters of all GHG emitted by human activities. Abating carbon dioxide emissions requires capture and sequestration technologies not yet commercially available.

Legal Implications: No Binding Obligations, but Future Ones Could Be Exacerbated

Rising coal exports would not compromise the ability of the United States to meet any existing, enforceable climate-related obligations of the U.S. federal government. Domestically, the Environmental Protection Agency (EPA) has set certain regulations to control methane emissions, but not on coal mines. The EPA has proposed performance standards for carbon dioxide emissions from large combustion units,[58] but these would not apply to exported coal.

In the international context, current federal commitments to reduce coal-related GHG emissions are not legally enforceable. For example, under the United Nations Framework Convention on Climate Change (UNFCCC), the United States adheres to an objective of avoiding dangerous human interference with the climate system, and to develop national plans that would reduce national GHG emissions. The United States has not agreed to legally binding, quantitative emissions caps. President Obama in 2009 stated a policy that the United States should reduce its GHG emissions to 17% below 2005 levels by 2020. However, there are no binding mechanisms for the international community to enforce this U.S. policy.[59]

In the future, rising coal exports could make it more challenging to reach any potential, absolute GHG target, whether set domestically or internationally. For the United States, on the one hand, increasing production of U.S. coal would tend to increase related methane emissions above what

[57] There is virtual unanimity among scientists that greenhouse gases in the atmosphere warm the Earth's climate, though some disagree whether rising GHG concentrations are the largest influence on certain time scales (e.g., of a human lifetime). Numerous scientific organizations have addressed this topic, including the National Research Council, *Advancing the Science of Climate Change*. America's Climate Choices: Panel on Advancing the Science of Climate Change. Washington, D.C.: The National Academies Press, 2010.

[58] See, among other reports, CRS Report R41561, *EPA Regulations: Too Much, Too Little, or On Track?*, by James E. McCarthy and Claudia Copeland.

[59] For more information on the UNFCCC, see CRS Report R40001, *A U.S.-Centric Chronology of the International Climate Change Negotiations*, by Jane A. Leggett. The UNFCCC contains dispute resolution mechanisms but no penalties.

would otherwise occur. On the other hand, coal exports would tend to raise domestic coal prices and thereby tend to curb U.S. coal use and related emissions. The balance between increases and decreases is unknown.

U.S. coal exports could make it more difficult for other countries to meet absolute GHG targets. Reportedly, European utilities have increased imports of relatively inexpensive coal from the United States, raising their GHG emissions and complicating their efforts to meet the European Union's legally binding GHG targets under European Union law and the Kyoto Protocol of the UNFCCC.

U.S. coal exports to China, India, and other rapidly growing coal consumers would likely affect efforts to persuade them to commit to reducing their GHG emissions. Past Congresses have resolved that binding commitments from such countries must be made for the United States to bind itself to GHG emissions under the UNFCCC.[60] In this sense, increasing U.S. coal exports would likely impair U.S. persuasiveness and cooperative efforts to negotiate a legal international framework that includes GHG reductions from China, India, and other countries.[61]

Table 6. Conceptual Legal and Climatological Implications of Increasing U.S. Coal Exports

	U.S. Domestic	Global
Legal Implications	None currently at federal level though possible in some states; could make setting any future, fixed GHG target more difficult.	Would make meeting existing, non-binding objectives more difficult.
Climatological Implications	Would increase coal production, processing, and transportation emissions in the United States. More international competition could raise or lower U.S. coal prices, tending to lower or raise (respectively) U.S. GHG emissions and consequent impacts on climate.	Would increase global emissions if U.S. exports increase available supplies and/or help suppress coal prices internationally; lower coal prices could also suppress investments in efficiency, nuclear, or other energy alternatives.

Source: CRS.

Physical Implications: Rising GHG Emissions Contribute to Climate Change

Increasing U.S. coal exports would likely contribute to rising global emissions of GHG, by increasing availability of coal and stimulating greater coal consumption due to lower market prices. Higher GHG emissions would add to suspected human-induced climate change globally as well as to local and transboundary air pollution and related health risks.

As noted above, U.S. coal production for export would increase U.S. emissions of production-related methane above what would otherwise occur, but could increase or decrease U.S.

[60] See the Senate's Byrd-Hagel Resolution, S.Res. 98 (July 25, 1997) and the Sense of the Congress on Climate Change of the 108th Congress in Section 1001, H.R. 6, agreed by both chambers and conference committee in 2003.

[61] Coal combustion in China, India, and other countries is also a major cause of acute air pollution, leading to hundreds of thousands of cases annually of morbidity and mortality linked with respiratory, cardiovascular, and cerebrovascular illness and diseases, according to the World Bank (2007) (http://siteresources.worldbank.org/INTEAPREGTOPENVIRONMENT/Resources/China_Cost_of_Pollution.pdf). The Chinese central government has promulgated stricter standards for emissions and air quality in recent years but struggles to obtain compliance with them.

combustion-related emissions of carbon dioxide. Current coal exports come primarily from the Appalachian region, which generally has higher potential emissions of methane than western surface mines. Though producers of Appalachian coal plan to expand exports,[62] much of the anticipated increase in exports would be produced in the Powder River Basin.[63]

The net effect is likely that increasing U.S. exports of coal could contribute to rising emissions of greenhouse gases (carbon dioxide and methane) as well as other pollution, although the increase could be small. No published study has thoroughly quantified this complicated question.

A Role for NEPA[64]

Broadly, NEPA requires federal agencies to consider the environmental impacts of their actions before a final decision is made regarding that action. Consideration of a proposed project's environmental impacts is described in the appropriate NEPA document. For projects anticipated to have a "significant" impact on the quality of the human environment, an environmental impact statement (EIS) must be prepared. Projects with uncertain impacts require preparation of an environmental assessment (EA) to determine whether the impacts would be significant.[65] The Corps has identified permit issuance among those actions normally requiring an EA, but not necessarily an EIS.[66] However, of the three Pacific Northwest coal terminal projects, the Corps has determined that an EA will be prepared for the Coyote Island transfer terminal and that the GPT and MBT will have significant impacts, requiring the preparation of an EIS.

During the project "scoping" phase of the NEPA compliance process, the Corps must clarify significant issues that will be analyzed in depth in the EIS. The scoping phase is currently underway for the GPT and MBT projects. As a result, the full range of issues that will be analyzed in each EIS is not yet known. However, in determining the scope of an EIS, the Corps is required to consider connected, cumulative, or similar project-related actions and the resulting direct, indirect, and cumulative effects of those actions.[67]

Permit applications pending before the Corps for export terminal expansion projects in Oregon and Washington may be considered connected or similar actions that would result in certain indirect or cumulative impacts. What is uncertain, however, is how broadly the Corps may define those terms. For example, it is unclear whether the Corps may identify increased train traffic out of Montana or Wyoming as an indirect effect of increasing coal export capacity related to permit issuance for the GPT or MBT projects. Also, given the current limits to commercial rail capacity in Washington and Oregon, it is not known whether the Corps would identify the potential need to

[62] See http://www.businessweek.com/ap/2012-08-15/india-to-get-9m-tons-of-appalachian-coal-annually.

[63] See, for example, the discussion in Todd Allen, "Alpha Natural Resources Third Quarter 2012 Conference Call" (November 2, 2012) at http://seekingalpha.com/article/974681-alpha-natural-resources-ceo-discusses-q3-2012-results-earnings-call-transcript?part=single.

[64] Although the emphasis of this section is on possible exports through the Pacific Northwest, the same rules apply to coal export terminals regardless of their location. The proposed projects in the Pacific Northwest, though, would be new facilities, whereas the Gulf Coast and Northeast proposed projects focus on expansions of existing facilities that may require less stringent regulatory approvals.

[65] For information about NEPA requirements, including those regarding preparation of an EIS or EA, see CRS Report RL33152, *The National Environmental Policy Act (NEPA): Background and Implementation*, by Linda Luther.

[66] Corps regulations implementing NEPA are found at 33 C.F.R. §230; actions identified as those normally requiring an EA are listed at §230.7(a).

[67] 40 C.F.R. §1508.25; indirect effects include those at that may occur later in time or farther removed in distance, but are still reasonably foreseeable; cumulative effects include those that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions.

expand rail capacity as a reasonably foreseeable indirect effect of port terminal permit approval. The potential need for new rail construction or the expansion of existing rail facilities may be particularly relevant if such activities were subject to approval from the U.S. Surface Transportation Board (i.e., a federal action subject to NEPA).

While it is difficult to determine the full range of project-related actions and resulting impacts that the Corps may include in the EA and EISs currently being prepared, a letter from the Corps indicates its approach to the environmental review process for the proposed projects. In response to a letter from Oregon Governor John Kitzhaber regarding concerns over the cumulative impacts of port terminal projects proposed in Washington and Oregon, the Corps states, in part:

> The effects that the Corps will consider in the review of each project proposal will include the specific activity requiring a DA [Department of the Army] permit, and those portions of the entire project over which there is sufficient federal control and responsibility to warrant Corps NEPA review. Based on existing law and DA regulations, the Corps will extend its scope of analysis beyond the proposed activity with the Corps jurisdiction…only where the Corps determines that extension to be appropriate under its NEPA regulations and other relevant authorities.[68]

What are unknown are which activities the Corps may determine are beyond its jurisdiction, but appropriate for consideration under NEPA. So far, at least, there appears to be some disagreement between EPA and the Corps over the potential project impacts that should be addressed during the NEPA process.

In an April 2012 letter to the Corps, EPA notes various elements of the Coyote Island terminal project that led EPA to determine that an EIS was necessary for that project.[69] That determination alone conflicts with the Corps' determination that the project would, at least initially, require the preparation of an EA. Additionally, in delineating the project impacts that warrant the preparation of an EIS, EPA identified the potential public health impacts from coal dust and diesel pollution related to the proposed Coyote Island terminal project; the high level of interest and concern among communities, agencies, interest groups, and industries regarding the proposal to transport coal from Wyoming and Montana to Asia; the uncertainty of potential impacts of transporting large quantities of PRB coal, including trans loading activities on the Columbia River; and the proposed and potential future projects' contribution to cumulatively significant impacts to human health and the environment from increases in greenhouse gas emissions, rail traffic, mining activities on public lands, and the transport of particulate matter and mercury from Asia to the United States, among other possible impacts.

To address the cumulative impacts, EPA recommended that the Corps conduct a broadly scoped cumulative impacts analysis of exporting large quantities of PRB-mined coal through the U.S. West Coast to Asia. The Corps has taken another approach and, as stated earlier, the Corps is preparing an EA for the Coyote Island terminal project and individual EISs for the other pending projects. EPA's assessment of potential project effects that should be included for analysis appears to be broader than the project-specific effects that the Corps would address in the NEPA documents for the three currently pending projects.

In addition to the April 2012 letter from EPA, some Members of Congress have also written to the Corps requesting that the scope of its environmental review include a comprehensive analysis of the cumulative impacts of all proposed port terminal projects. The Corps accepted comments

[68] Letter from Jo-Ellen Darcy, Assistant Secretary of the Army, to Governor John A. Kitzhaber, M.D., July 8, 2012, available online.

[69] In framing the proposed project's impacts, EPA structured a significance determination using regulatory criteria, at 40 C.F.R § 1508.27, that are used to identify the context and the intensity of a project's impact.

from the public until early 2013 regarding the potential scope of issues it will analyze in the GPT and MBT EISs. It may be sometime after the scoping process is complete before it is known how extensively the Corps will consider indirect and cumulative impacts of the proposed projects. In June 2013 the Corps announced that it would not conduct an area-wide EIS of the potential impacts of the three proposed export terminals.

Issues and Interests

The Obama Administration continues to support clean coal, natural gas, renewables, and uranium as energy sources for electric power in the United States, as U.S. coal exports continue to rise. The Administration has not been clear where it falls along the spectrum of coal exports but announced on June 25, 2013, a proposal to limit U.S. government financing of coal plants overseas as part of an overall U.S. strategy to reduce carbon emissions.

As U.S. hydrocarbon resources have expanded over the last few years, there is greater interest by some groups, mainly producers, to export a portion of these resources. In addition to coal, the United States became a net exporter of petroleum products in 2011, and there are 23 pending liquefied natural gas export projects at various stages of the regulatory approval process. There has even been interest in possibly exporting crude oil from the United States in the future.

Planned expansion of U.S. hydrocarbon exports has generated some controversy. Environmental groups and various consumer groups have been most vocal against exports. Coal exports have attracted greater attention from both sides of the question as fast as new projects have been proposed. In addition to areas where new port capacity is being proposed, some communities along potential and existing rail routes, and mining sites, have voiced their opposition.

Congressional Action

Coal Export Legislation

- H.R. 2396, the True Cost of Coal Act of 2013, would extend to 50 years the recovery period, for depreciation purposes, for specified coal port property used for the export of coal.
- S. 831, the Coal Miner Employment and Domestic Energy Infrastructure Protection Act of 2013, would prohibit the Secretary of the Interior, before December 31, 2017, from issuing or approving any proposed or final regulation under the Surface Mining Control and Reclamation Act of 1977 that would: (3) reduce the quantity of coal available for domestic consumption or for export.

Hearings

- House Energy and Commerce Committee, Subcommittee on Energy and Power, "U.S. Energy Abundance Regulatory, Market, and Legal Barriers to Export," June 18, 2013, addressed coal exports.
- Science, Space, and Technology Committee, Subcommittee on Energy, "The Future of Coal: Utilizing America's Abundant Energy Resources," July 25, 2013.

Additional Reading

CRS Report R42950, *Prospects for Coal in Electric Power and Industry*, by Richard J. Campbell, Peter Folger, and Phillip Brown.

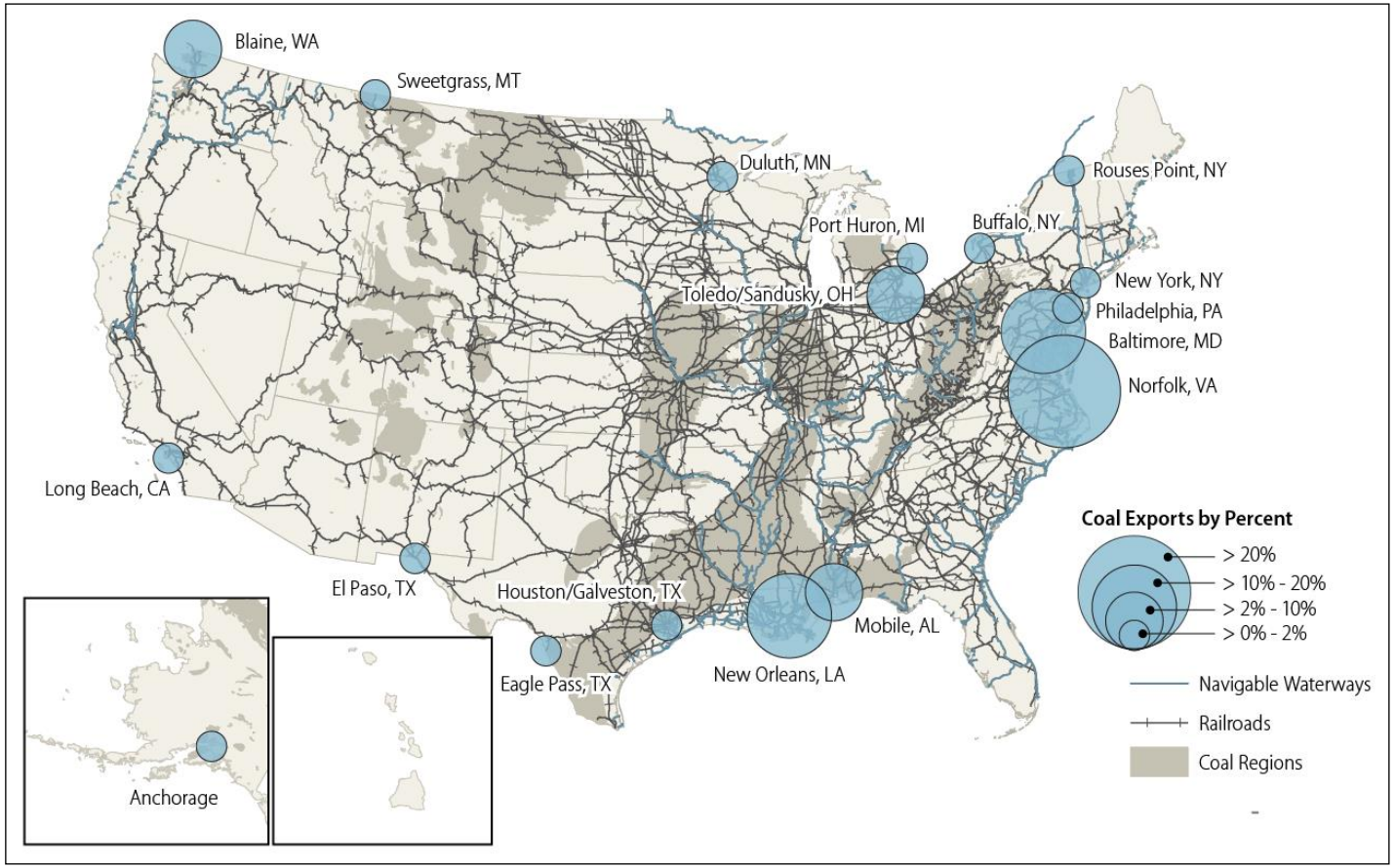
CRS Report R43011, *U.S. and World Coal Production, Federal Taxes, and Incentives*, coordinated by Marc Humphries.

U.S. Coal Exports: National and State Economic Contributions, Prepared for the National Mining Association, by Ernst and Young, May 2013.

Our Pain, Their Gain: Mountains Destroyed for Coal Shipped Overseas, by U.S. House Committee on Natural Resources—Democrats, July 19, 2012.

Appendix A. Map of Coal Deposits and Infrastructure

Figure A-1. Coal Deposits and Infrastructure



Source: Compiled by CRS.

Appendix B. Characteristics of Different Coals

Coal—a dense carbonaceous fossil fuel—is formed from decayed organic matter that has been subjected to various temperatures and pressures without the presence of oxygen. This burnable rock also contains quantities of hydrogen, sulfur, and nitrogen, and other elements and various amounts of mineral matter. Coal seams are formed along with other sedimentary rocks, primarily sandstone and shale. There are four basic types of coal with varying characteristics throughout the United States. The characteristics of a particular coal will determine how it is used, mainly for heat or electric power generation, or in steel production. Coal quality is measured by its energy value (e.g., British thermal units or Btus per pound),[70] moisture and sulfur levels, and ash content.

Lignite: A brownish-black coal with high moisture and ash content and relatively low heating value, between 4,000 British thermal units (Btu) to 8,300 Btu per pound. It contains the lowest carbon content of the four types of coal, and is usually consumed in electricity generation. Lignite is mainly mined in Texas, North Dakota, Louisiana, and Montana.

Sub-bituminous: This type of coal was the most produced coal in 2011, accounting for 47% of U.S. production. It is a dull black coal with higher heating value than lignite and used for generating electricity and space heat. Its Btu content ranges from 8,300 Btu to 13,000 Btu per pound. Resources are primarily found in Montana, Wyoming, Colorado, New Mexico, Washington, and Alaska.

Bituminous (soft coal): This type of coal is the most abundant in the United States and has a higher heating value than sub-bituminous and lignite, between 10,500 Btu and 15,500 Btu per pound. It is typically used for electric power generation in the United States. Coke is also produced from bituminous coal. Metallurgical coke produced from bituminous coal is used to make steel. It is found primarily in Appalachia and the Midwest.

Anthracite (hard coal): Anthracite has the highest carbon content and energy content (15,000 Btu per pound) of all coals but occurs in limited geographic areas, mainly in Appalachia and Pennsylvania. The highest grades are used in metallurgy.

Thermal Coal: Coal that is used primarily to generate steam or heat for industrial purposes. Used in electric power generation.

Metallurgical Coal: Also known as coking coal, this type of coal is used to make steel.

Appalachia: Primarily the East Coast of the United States, and includes the North, Central, and Southern Appalachia Basins.

Interior: Mainly in the Midwest part of the United States and includes the Illinois Basin.

Western: Mostly the Rocky Mountain region of the United States and includes the Powder River and Uinta Basins.

[70] British thermal unit or Btu is defined as the amount of energy required to heat one pound of water from 39/ F to 40/ F.

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